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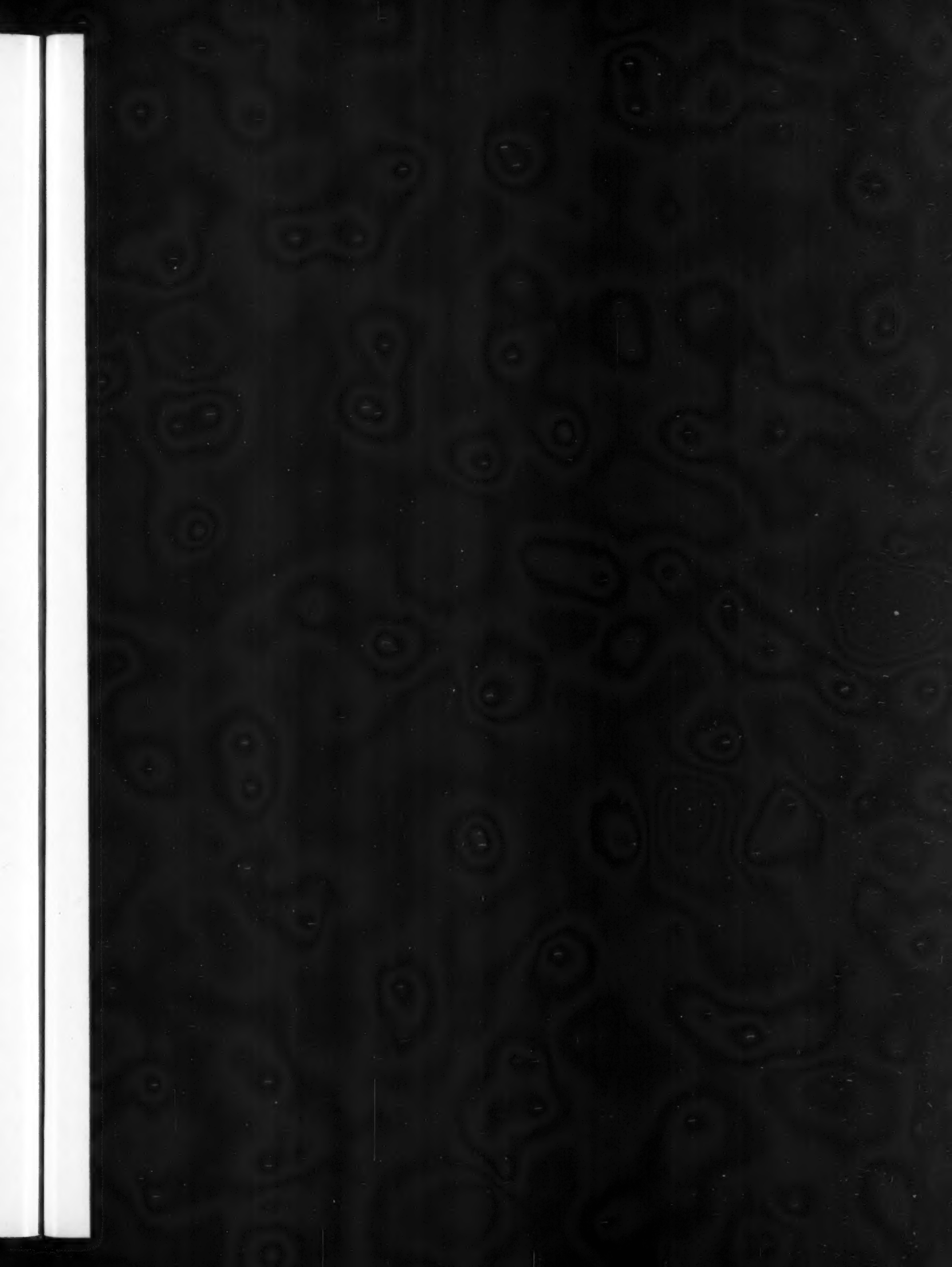

THE

Journal of Electricity, Power and Gas

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The Engineers', Architects' and Builders' News

VOLUME XX. SAN FRANCISCO, CAL., JANUARY 18, 1908 No. 3

UNIQUE GAS ENGINE AND STEAM ENGINE ELECTRIC STARTERS.

In starting steam engines and gas engines of very high power, electric auxiliary apparatus is utilized to great advantage. Engines of several thousand horsepower are usually provided with very heavy flywheels or revolving fields of alternators on direct connected sets, which required considerable power to start from rest, when the working power of the engine is not readily applied.

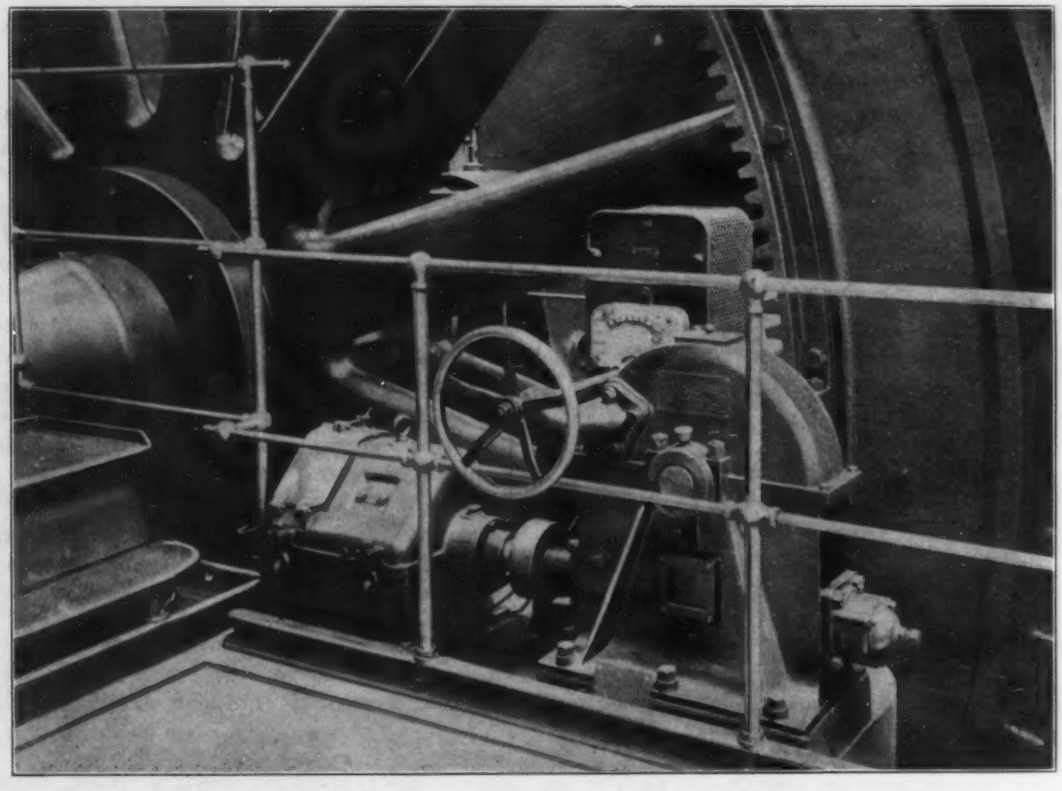


FIG. 1. ELECTRIC STARTER FOR 6000 H. P. ENGINE.

The accompanying illustrations and drawing show the details of construction and method of operation of two or three novel types of German electric starting devices of more than passing interest.

The electric motor-driven starters noted in Figs. 2 and 3 have been installed on the 2,000-horsepower and 3,000-horsepower engines in the power houses of the Electric Central Stations at Duisburg and Charlottenburg, Germany, also at the power plant of the "Schiffswerft, Harland & Wolff, in Belfast, Ireland.

The motor used is of 6-horsepower capacity, operating at 750 revolutions per minute, the pressure at the pitch line being 2,000 to 3,000 kilograms in starting these heavy flywheels. The above motor is of the direct current type, operating on 220-volt circuit. Where three-phase motors are used of 50 periods, with a pressure of 500 volts, a larger motor of 10-horsepower capacity is used, operating at 725 revolutions per minute.

As soon as the engine has reached the proper speed and is working by its own power, the electric starting motor is automatically, mechanically and electrically from the large engine sets and comes to rest.

At the Electric Station of the Charing Cross Company,

in London, England, the type of electric starter noted in Fig. 1 was installed by the Felten & Guilleaume-Laymeyerwerke, of Frankfurt-a-M., Germany, for bringing the 6,000-horsepower steam engines into service.

This equipment includes a direct current motor of 9-horsepower, operating at a speed of 670 revolutions per minute, the pressure at the pitch line being 3,800 kilograms

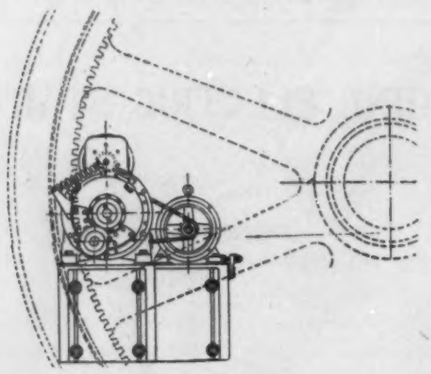


FIG. 3. ELECTRIC STARTER FOR 3000 H. P. ENGINE WITH CHAIN MOTOR DRIVE.

to 6,000 kilograms on these large units, requiring starting by gearing to the inner part of flywheel rim.

Equipments of this size for starting high power gas engines, driving alternators, where three-phase alternating current is to be utilized with a frequency of 50 cycles and 500 volts pressure, require the installation of a polyphase

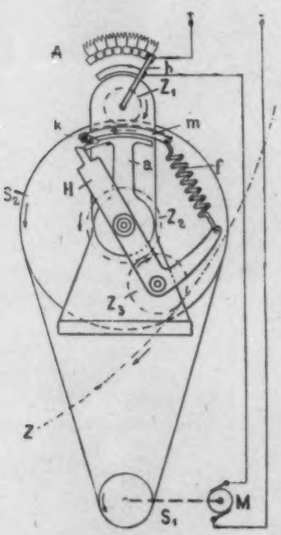


FIG. 4. MOTOR STARTER, ELECTRIC CONNECTIONS AND CUT OUT MACHANISM.

motor of 14-horsepower capacity operating at 720 revolutions per minute.

It will be noted that the electric power is transmitted to the pinion on the flywheel rim by chain drive from the electric motor armature in the outfits starting the 3,000-horsepower engines, while direct connection through worm gearing is employed on the electric starters noted in Fig. 3 for the 6,000 horsepower engine sets.

The accompanying drawing, Fig. 4, shows the electrical connections of this equipment, and mechanical automatic apparatus, M being the starting motor, A the starting

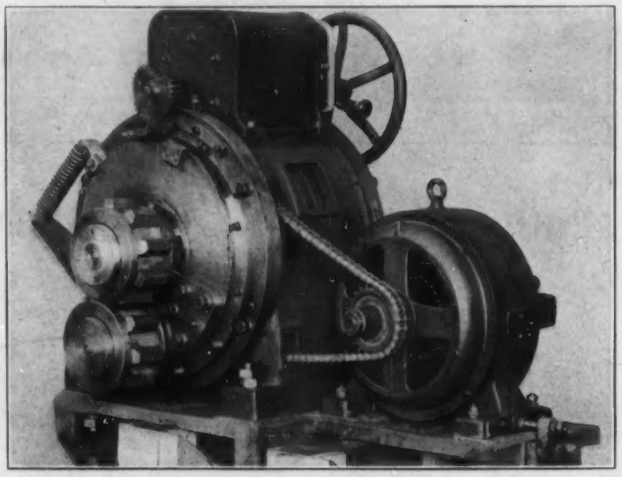


FIG. 2. ELECTRIC GAS ENGINE STARTER.

rheostat, Z Z toothed pinions, and H, and F the lever and spring, determining the speed at which the device is automatically cut out.

All the switches of the Pacific Telephone and Telegraph Company in San Francisco have been changed to "local" lines. This will extend the local service to Oakland, Berkeley, Alameda, the smaller connecting cities on the Alameda side, San Rafael and the cities down the peninsula. Instead of a separate telephone directory for each city, one large book will contain the names and addresses of the subscribers in the bay cities. The long distance operator is to be eliminated under the new system, as far as the service about the bay is concerned. The cities comprised in "Greater San Francisco" will be connected by direct trunk lines. This will enable the company to eliminate the delays whch now intervene in the transbay switches. The result will be a quicker service for all points about San Francisco. With the inauguration of the new system came a reduction in rates. The company will extend the time permitted for a call from one city to another from one minute to three minutes for the same charge of 15 cents.

Three-phase alternating current locomotives are to be used on the 140 miles of the Arlberg road between Innsbruch and Feldkirch, Switzerland, supplanting an existing steam system. An output of 3,000 horsepower is demanded from a locomotive weighing 60 tons or less, an impossible condition for single-phase or direct current locomotives at present. Electric braking and regeneration of power by descending trains is to be employed. A 40,000 kilowatt hydro-electric station is projected to supply power for fifty locomotives. Prof. C. L. de Muralt, of the University of Michigan, has been selected as consulting engineer by the Austrian Government.

Frosted bulbs have shorter lives than clear-bulb lamps, and also become hotter. This is not due to any decrease in the filament life, but to the greater light absorption with deposited carbon. In the December issue of the "Bulletin of Standards," Dr. Ed. P. Hyde and F. E. Cody designate the light-decreasing effect of frosting as the "change of absorption," and find that it amounts to six per cent for seasoned lamps.

STREET LIGHTING IN 1907.*

By Alton D. Adams.

England has shown a relatively large increase of gas lamps in spite of electric competition, and it has also put into extended use automatic systems of gas street lighting, inverted street burners, and high-power gas lamps that dispute the places of electric arcs in some of the most important thoroughfares. In the United States, on the other hand, open flat-flame street lamps have been displaced by nothing more imposing or attractive in the way of gas burners than the upright mantle giving some 50 candle-power when new, and lighted and extinguished with the irregular rounds of the lamp boy.

Automatic systems of gas street lighting, as applied in England, depend either on a small clock mechanism at each burner, or on a momentary increase or decrease of pressure in the mains, to start and extinguish the lamps. When the gas is automatically turned on, the lighting is done by a minute pilot jet that burns constantly. Among numerous places in England where automatic gas lamps are in use for street lighting may be mentioned Tottenham, which has over 1200 such lamps.

In Tipton, England, 456 gas street lamps were equipped with an automatic lighting attachment during the past year, and it was found that the six persons formerly employed to clean, repair, light and extinguish the lamps could be replaced by two, with a resulting saving in wages of more than one thousand dollars annually. Under the system of hand lighting and extinguishing, an average of 12 mantles and 9 chimneys had been required per lamp per annum, but with automatic lighting the average for each lamp was reduced to 6 mantles and 15-100 chimney per annum. The saving of gas by the automatic system, due to the fact that lamps are burned during only the hours when wanted, is much larger than the consumption by the pilot jets. The cost of installing the automatic lighting apparatus at Tipton was under five dollars per lamp.

Since the erection of some 6,000 inverted mantle burners to light the streets of Edinburgh, Scotland, in 1906, the adoption of this type of gas street lamp has been going on rapidly in the United Kingdom. These inverted burners were selected for street lighting in Edingburgh after tests of durability, gas consumption and candle power that ran back to June, 1904. Fourteen makes or types of inverted gas burners were tested, and the burner selected showed a consumption of 2.2 cubic feet of gas per hour at a water pressure of two inches, and gave at this consumption 72 horizontal candle power or 32.73 candle power per cubic foot of gas per hour. This high efficiency is due in part to the excellent quality of Edinburgh gas, which has a gross heating power of about 700 British thermal unit per cubic foot. As adjusted for street service, each of the inverted burners at Edinburgh consumes 2.25 cubic feet of gas hourly at the water pressure of two inches, which amounts to 9,000 feet of gas during 4,000 hours of lighting, a not uncommon duration annually for street lighting.

Among the fourteen types or makes of inverted burners tested at Edinburgh the candle power obtained per cubic foot of gas consumed per hour varied from 14.16 up to 32.73 candle power mentioned for the burner selected, showing the importance of the best construction in such burners.

Besides the higher efficiency and lower gas consumption of inverted mantle burners, as compared with the ordinary upright type, the inverted burner is better suited for street lighting by reason of its superior distributive power of the light developed, and because of its more artistic appearance.

Large incandescent gas lamps, containing several mantles each, and having special interior constructions according to the make, are being made in both England and the United States for the development of candle powers that compare more or less favorably with those of electric arcs.

These large gas lamps with groups of mantle burners, sometimes called gas arcs, are made in England for a gas consumption of as much as fifty cubic feet per hour each, and to develop up to at least 1,500 mean spherical candle power. In these lamps the efficiency of 30 or more mean spherical candle power per cubic foot of gas burned per hour, which is decidedly above that of ordinary mantle burners, is obtained by a thorough mixing of the air and gas, and by heating the mixture before it reaches the mantles, so that a rapid rate of combustion and high temperature are developed.

Competition for the public lighting has brought large numbers of these high-power gas lamps on to important streets in various cities of England, and in London they are lighting the streets at Parliament Square, Buckingham Palace, the Mansion House, and Oxford Circus, among other points. A high-power mantle gas lamp using 30 to 50 cubic feet of gas hourly, and developing 1,000 to 1,500 mean spherical candle, is a strong competitor of the best forms of electric arcs, especially in view of the fact that the gas lamp gives its strongest rays of light in a nearly horizontal direction, so that they reach the ground at distant points.

High-power gas lamps are being adapted to interior lighting to quite an extent in the United States, but as yet little or nothing has been done with them here for street lighting purposes. Large numbers of open flat-flame gas burners are still used for street lighting in this country, and give probably no more than 10 to 15 candle power each, though the gas consumption may easily reach eight to ten cubic feet per hour with the high pressures now common in the mains. Such open burners for street lamps impose a double loss on the public, and should be replaced with mantle burners or electric lamps at once.

Both England and the United States are using large numbers of the ordinary single mantle upright gas burners for street lighting, and on this side of the ocean, at least, the horizontal candle power of such burners when new is probably seldom above fifty. Such burners have a normal consumption of about 3½ feet of gas per hour, and an actual consumption that depends on the pressure in the pipes where they are attached, and on the burner adjustment.

On the basis of 3.5 feet of gas per hour, the consumption of one of these upright mantle burners reaches 14,000 feet during the ordinary lighting period of 4,000 hours per year, so that the cost of dollar gas for this period is fourteen dollars. With a reasonable amount added for the care of the burner, including the renewal of mantles, so as to bring the total annual charge up to not more than twenty dollars per lamp, these upright burners are strong competitors of incandescent electric lamps, but the force of this competition vanishes when the annual charge for the gas lamp goes up to from $25 to $35.

In England, the practice is for each gas company to operate the gas street lamps within its area of supply, but in the United States there has grown up the peculiar practice of contracting with a foreign corporation to light city streets, in cases where gas is to be the illuminant. The foreign corporation then buys the necessary gas from the

*Condensed from "Municipal Journal and Engineer."

local company, and collects the agreed price from the city. Just how the extra pickings incident to this method of doing the business are divided between the several parties the data available does not show.

Electric street lighting has fared much better than that with gas in the United States, and in the matter of metallic arc lamps, at least, this country appears to be leading England at the present time.

A recent investigation of electric street lighting in forty-one cities and towns of Great Britain gives interesting data of the conditions there as to the relative numbers of the several types of lamps in use for this purpose. In the forty-one cities and towns, it appeared that 11,761 arc street lamps were in use, of which 9,371 were of the open type, 2,007 were inclosed, and 377 were the so-called flame arcs. Besides these arc lamps, there were 8,760 columns carrying various forms of incandescent electric lamps,

The fact that 9,371 of the 11,761 lamps were open arcs shows a marked contrast with the practice in the United States, where inclosed arcs now far outnumber the open. One of these flame arcs operated with about 400 watts is capable of developing 1,800 maximum and 1,300 mean hemispherical candle power, but this maximum occurs between 40 and 50 degrees below the horizontal, and most of the great volume of light reaches the ground within a few feet of the lamp. This type of lamp thus produces in an aggravated form the undesirable inequality of street illumination that has ever been characteristic of arc lighting. With a short life of carbons like that in the ordinary open arc, the flame arc also involves a relatively high cost of carbons because of their loading to produce the incandescent vapor that yields the high candle power.

Reason for the large displacement of open by inclosed arcs, in the United States, in contrast with the English practice, is mainly found in the cheaper operating qualities of the inclosed arc equipment both inside and outside of electric stations. The inclosed arcs if of the alternating type, as is more commonly the case, obviate the operation of arc dynamos, and take energy from the generators that carry the incandescent light and the motor load, through constant current transformers. A material increase in the efficiency of operation results from this change. While the double open arc lamp must be trimmed after about ten hours of burning, and then requires two pairs of carbons, a single pair of carbons lasts one hundred or more hours in the inclosed arc, and the latter thus effects a material saving of both carbons and labor.

During the past year, a new type of arc lamp, in which electrodes of copper and of metallic oxides take the place of carbons, has been installed for street lighting in a number of cities, and bids fair to find extended use for this purpose. Owing to the metallic nature of the electrodes between which the arc is formed in this type of lamp, the period of its operation from one trimming to another is said to reach 150 or more hours, with a correspnding reduction in labor, and the cost of the metal electrodes is much less per hour than that of carbons in the open arc. In the ratio of energy consumption per candle-power hour, the metallic-oxide arc does not equal the flame arc, but the former gives a stronger light at angles near the horizontal, and is much better suited for street illumination.

One make at least of this metallic-oxide arc operates with not over 300 watts of direct current, and this lamp is being installed to replace open arcs that run on 450 to 500 watts each. A case in point is that of Louisville, where some 2,400 of the open type have been replaced with the metallic arcs. This metallic arc shows a reduction of nearly 40 per cent of the energy required by the 480-watt open arc, and there is also an important saving in the labor of trimming, so that the introduction of the former may fairly be accompanied by materially lower rates.

Incandescent electric street lighting has lagged far behind its proper development in the United States, in part, at least, because of the low efficiency and high operating costs of lamps available for the purpose. Street lighting is so scattered that it is usually very desirable to operate the lamps on series circuits for this purpose. For such circuits the highest efficiency of available lamps with carbon filaments has generally been 3.5 watts per candle power, though the carbon lamp has been made to yield a candle power for every 3 and even 2.5 watts, on constant pressure circuits. With rates based on the 3.5 watt series lamp, it has usually been possible to obtain more street lighting for a dollar with the incandescent gas mantle than with the carbon filament.

There is no longer good reason or excuse for the conditions just noted, for the new tantalum and tungsten filaments are both especially suitable for series connection, where the lamp voltage is relatively low, the current large, and the incandescent strand thick and stout. In the construction of tantalum and tungsten lamps for the ordinary 110-volt circuits, the most serious problems are due to the relatively great length and small diameter of the wire that is to carry less than one-half an ampere. When the volts per lamp may easily be 10 to 15, and the current several amperes, as in series working, the cost of lamp construction is evidently reduced for these metal filaments.

As the tantalum lamp yields a candle power for 2 watts, and the tungsten lamp a candle power for not more than 1.2 watts, the application of these metal filaments to electric street lighting should lower the cost and largely extend the service; and it is probable that the coming year will see progress in this direction.

THE WISDOM OF BOB THE SHIFTMAN.

1. If a circuit-breaker comes out on night shift, wait; another may follow, and this will save you getting up twice.

2. If a fly-wheel burst and brings down the main steam-pipe, do not rush for the door; other collectors of fresh air will be using it. Try the window.

3. You look after the volts; the amperes will look after themselves.

4. Overloads are deceptive. Many plants will climb a peak, but they will not therefore walk along a plateau.

5. Never admit that the volts were back at eight o'clock last night.

6. When David said: "All men are liars," he must have been thinking of our junior's section of the log sheet.

7. No man is perfect. The engineer who repaired a broken crank-shaft while the machine was running, still has to keep his hands in his pockets till his landlady has mended his braces.

8. If you are determined to switch in the 1,000 kilowatts set exactly out of phase, make a job of it, so that no one else can do it for weeks.

9. The surprise of Jezebel when she was pushed out of the window was nothing to that of our volt boy when he hung his tea-can on the terminals of the main voltmeter.

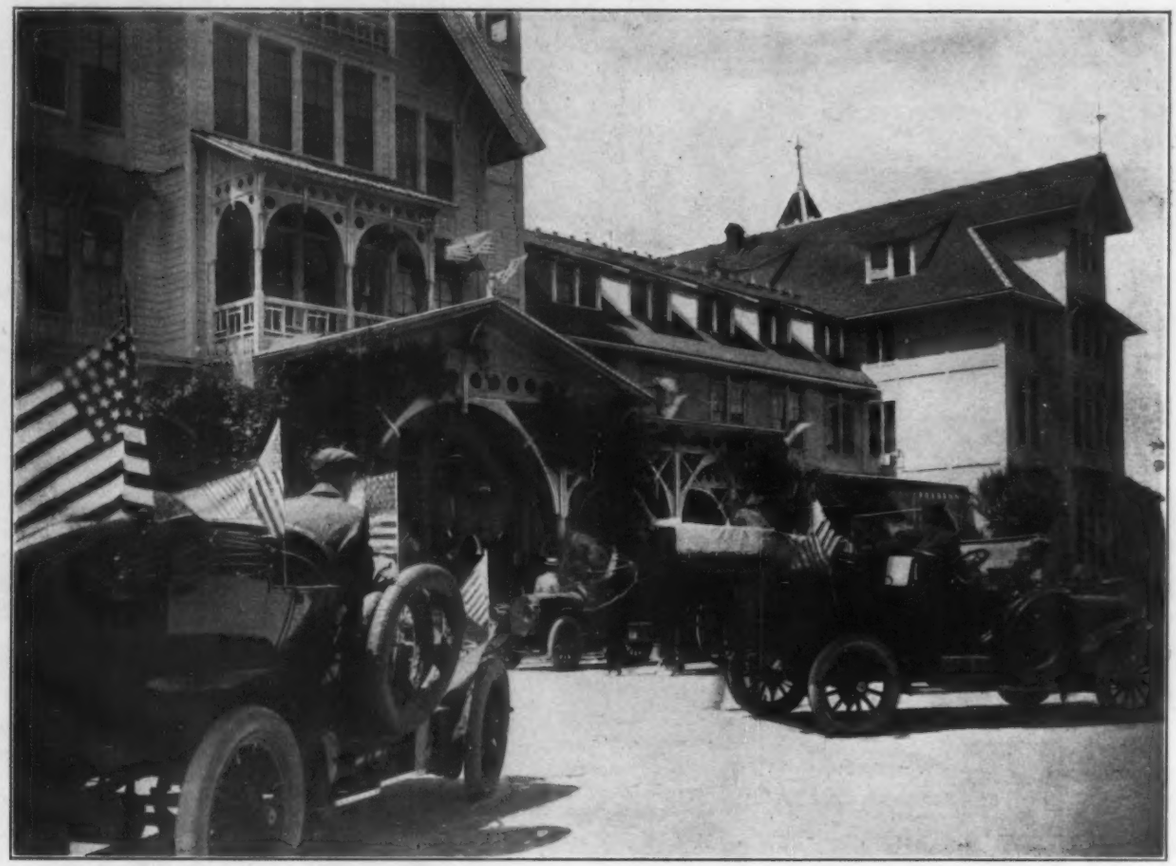
10. A machine that won't excite itself very often excites the engineer in charge.

11. One of the disadvantages of mechanical stokers is that they cannot make a fourth at Nap.

12. Asking the chief for a rise, when the manhole covers are flying about like kites, is asking for trouble.—The "Electrical Review."

ELECTRICAL MEN HAVE AN OUTING.

Thursday afternoon, January 9th, some thirty convivial souls left San Francisco, on the Monterey Express, for Del Monte. At the beginning, it had somewhat the appearance of a "pipe dream," as Mr. Alex. Henderson, representing the American Circular Loom Company, of Chelsea, Mass., presented to each of the delegates a briar pipe, neatly incased in a box. Cigars were tabooed, and the pipe of peace and plenty was smoked from that time. A warm welcome awaited the delegation by one of the most genial of managers, Mr. H. E. Warner. After dinner, cards, billiards and music were in order until a late hour. Friday morning was devoted to a feast of reason, the afternoon to automobile sight-seeing of the scenic and historic interests of the vicinity.



Courtesy Hotel Del Monte.

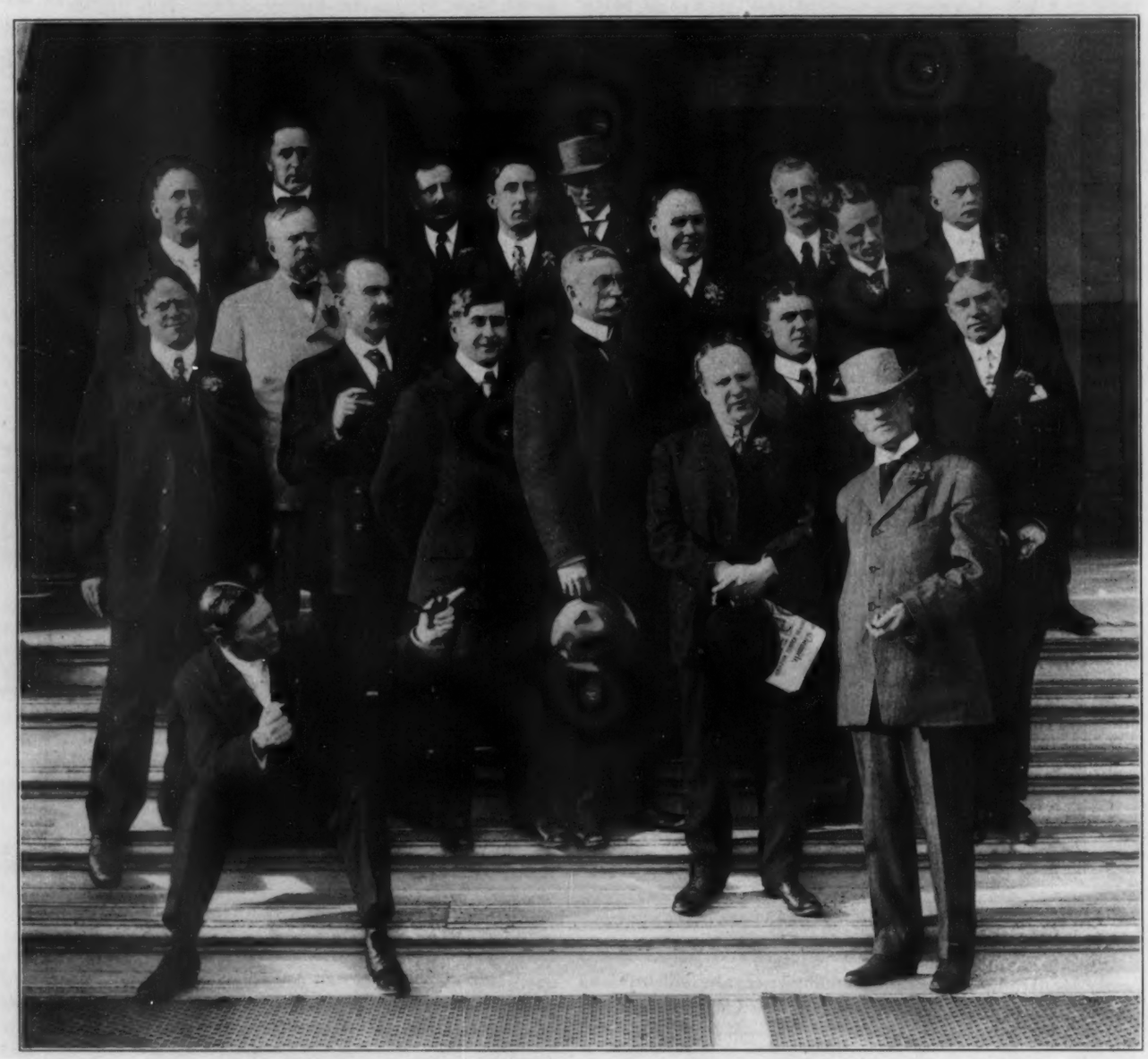
WHERE THEY MET—HOTEL DEL MONTE.

One of the happiest surprises of the trip was a noon banquet, given by our genial friend, Mr. Alex. Henderson. The table was most daintily decorated with carnations and ferns, and a boutonniere at each plate. The menu consisted of the choicest of viands from the larder and vintage. The table was set in the main dining room, far enough removed from the regular guests so that the toasts and speeches did not seem to disturb them. The writer noticed that many of them remained throughout the entire banquet. It seemed that they, too, enjoyed the flow of good spirits.

ENDERSON has been visiting the Pacific Coast in the interest of his company for the past six weeks. His first visit was made five years ago as the representative of the Sprague Electric Co. Two years ago he assumed his present position with the American Circular Loom Co. His address to the delegation was not only expressive in the language used, but carried with it a sentiment echoed in the heart of each and every one of the members present that they, too, might some day have an anchorage. He told of his boyhood experiences in a far Australian village, alone, stranded and homesick. One day, while strolling near the wharves, he met by accident the master of a sailing ship, to whom he applied for a position. By good fortune, as he thought at that time, the captain gave him a berth before the mast. The trip, from the time they left Australia until they finally reached the harbor of New York, some two hundred and forty-four days, was fraught with hardships that but few are ever called upon to bear. Storm after storm they encountered, and fought as only sailors in desperation fight for their lives. Finally, when the anchor chain rattled, and the old mud-hook held fast, there seemed but one thought in the hearts of the entire crew, and that was "Thank God, we have anchored at last!" That thought seemed to have grown in strength from time to time during some thirty-

five years of active business life, always the light in the window, on the rock-bound coast of this great sea of trouble and care, placed there by the good mother, guiding him even as it does the mariner. It was his dream to have in his declining years an "anchorage," a home where he could welcome his friends, and again enjoy that perfect peace and contentment that those sailors felt at the moment of safety in the sheltered harbor. This dream has been realized by the purchase of several acres of land in a beautiful spot in the New Hampshire hills, in the neighborhood of Boston. There he has built a modest cabin home, and has named it "The Anchorage," where he has invited all those in the electrical profession, who at any time come within hailing distance of his den, to visit him. As he expressed it, "the latch string will not be hanging on the outside, for there is no latch string, but the welcome will be just as warm." A standing toast to his long life and contentment in his chosen spot, was given with a hearty good will.

Friday evening, as the invited guests of the jobbers, the manufacturers and manufacturers' agents arrived, and met at the grand banquet of the occasion. To describe the banquet table would require a more able pen than that of a technical writer. Suffice it to say, that the cloth was spread with the most delicate of china, glassware and linen. The floral decorations were stemmed violets and maiden-hair fern, orchids, and many other of the choicest blooms to be found in any part of the world to-day. The hollow square around which the tables were set was filled with ferns and gorgeous leaf plants.



T. E. Bibbins, R. W. Van Valkenberg. W. A. Landry. C. A. Gilsen, B. C. Holst, A. W. Ballard, F. V. Carter, G. A. Knoche, E. B. Strong, A. H. Elliott, R. J. Davis, H. C. Thaxter. C. C. Hillts, Alex Henderson, S. B. Gregory, E. M. Scribner, W. L. Goodwin, seated, E. N. Fobes, R. D. Holabird.

The menu card was not only unique, but very handsome in its design. On the cover an incandescent lamp with a wire from a shell and spray of sea fern connecting the socket, the lamp being mortised out to show an exquisite scene of the Hotel Del Monte, in colors.

The menu itself is worthy of history, as will be found by reading the following:

MARTINI COCKTAIL—"HOW."

BLUE POINTS.
"Fruits of the sea and shore, all dainty and delicious."

CREAM OF CELERY, LIVINGSTONE.
"Taste of it first."—King Richard II.

CONSOMME BERCHOUX.
"A Hot friend cooling."—Julius Caesar, IV:2.

OROVILLE RIPE OLIVES. CELERY EN BRANCHE.
"The simple olives, best allies of wine."—Byron.

SALTED ALMONDS. MIXED PICKLES.
"To think that only toothsome which can bite."—Edward Hyde to T. Randolph.

BOILED STRIPED BASS, SAUCE HOLLANDAISE.
"I shall no more to sea, to sea,
Here shall I die ashore."—The Tempest.
POMMES DE TERRE, DUCHESSE.

SUGAR CURED HAM, CHAMPAGNE SAUCE.

CRAB MEAT, A LA NEWBURG.
TENDERLOIN OF BEEF, LARDED, FINANCIERE.
"Inventions to delight the taste."
PINEAPPLE FRITTERS, MARASCHINO SAUCE.
"Give us the luxuries of life, and we wil dispense with the necessaries."—Motley.

SORBET DEL MONTE
"Then farewell heat and welcome frost."—Shakespeare.
ROAST SPRING CHICKEN AU CRESSON.
"The Justice,
In fair round belly with good capon lined."
ROAST PRIME RIBS OF BEEF.

BOILED AND MASHED POTATOES. STRING BEANS.
SPINACH IN LEAVES AU BEURRE.
"How green you are, and fresh."—Hood.

BAKED HUBBARD SQUASH.
HEARTS OF LETTUCE.
"My salad days, when I was green in judgment."
—Antony and Cleopatra.

LOBSTER MAYONNAISE.
"Let onion atoms lurk within the bowl
And, half suspected, animate the whole."—Sydney Smith.

HOT MINCE PIE. VANILLA CUSTARD PIE.
FIGARO PUDDING WITH WHIPPED CREAM.
"When I have tasted of this sacred dish."
—Beaumont and Fletcher.

NEAPOLITAINE ICE CREAM. TANGERINE SLICES.
"I always thought cold victual nice;
My choice would be vanilla ice."
—O. W. Holmes—Contentment.
FRUITS IN SEASON. NUTS AND RAISINS. FIGS.
"Praise us as we are tasted."

ROQUEFORT. BRIE. EDAM. RANCHO DEL MONTE.
CRACKERS. DEMI TASSE.
"Oh, 'tis excellent to have a giant's strength."
—Measure for Measure, 11:2.

CREME DE MENTHE. COGNAC. CIGARS.
"Some smoke here, some hereafter."

Mr. T. E. Bibbins, of the General Electric Company, as usual, in his happy way, acted as master of ceremonies. It has been the privilege of the writer to attend many gatherings of this kind, but we say it without any intention of flattery, Mr. Bibbins as toast-master is prince of them all. He honored Mr. C. C. Hillis with the first call for a speech, and from that moment the fun began. Mr. Holabird (the silent) called for a point of privilege, and was allowed to make a few remarks. Then, in an able manner, Mr. Hillis told a few things he knew. For fear of being accused of hyperbole, the writer will not endeavor to repeat any of the speeches of the evening. Mr. E. M. Scribner, of the California Electrical Works, was the next speaker in order. He told a quiet little story—we'll stop right there. A song from Mr. Holabird, accompanied by the orchestra, the violin and harp, entitled the "Hoola Hoola," was next in order. Those who responded to toasts were, in the order named: Mr. F. E. Corwin; Mr. J. Froesch, of Los Angeles; Mr. R. J. Davis, of the Standard Electrical Works; E. B. Strong, The "Press"; Mr. Alex Henderson; Mr. John R. Cole, the old pioneer, of the John R. Cole Company; Mr. Garnet Young, of the Telephone and Electric Equipment Company; Mr. Will Goodwin, of the Sterling Electric Company, subject, "Air Brakes"; Mr. Drendell, of the Drendell Electric Manufacturing Company; Mr. Knoche (and all the boys liked him); Mr. Van Valkenberg, of the California Electrical Works, on the subject of "Credits" (how much have you got?); Mr. Holabird, with more stories; Mr. Pierce, of Shelby Incandescent Lamp Company; Mr. C. E. Winchell, of H. W. Johns-Manville Company; Mr. A. H. Elliott, Oakland's boy orator, and others.

Mr. R. J. Davis introduced a very happy resolution that was unanimously carried that each new addition to the electrical fraternity presented by the wives of the members would receive a loving cup. A very substantial collection was taken up, and Mr. John R. Cole and Mr. H. C. Thaxter would do well to prepare their little speeches, as they surely have something coming.

Good cheer, song and music lasted until an early hour. When the convention closed, it was with a good fellowship that Mr. Elliott, in most eloquent language, impressed upon the minds of all the purpose for which these conventions are held, bringing closer together not only the wholesalers, but the wholesalers, manufacturers and contractors. And it did seem that the object had been fully attained.

Most of the guests left on the early train Saturday morning, a few remaining over to enjoy the beauties of the place and the many interesting surroundings. The weather was perfect, with just enough crisp in the air to make it invigorating, and yet, to an Easterner, it would be considered as a balmy day in June.

Those present were: T. E. Bibbins, General Electric Co.; C. C. Hillis, Electrical Appliance Co.; F. E. Corwin, Bryant & Perkins Co.; W. A. Landry, Dunham, Carrigan & Hayden; G. A. Knoche, Dunham, Carrigan & Hayden; A. D. Pierce, Shelby Incandescent Lamp Co.; Edw. Preston, Standard Undergound Cable Co.; C. E. Winchell, H. W. Johns-Manville Co.; Garnett Young, Telephone & Electric Equipment Co.; F. V. Carter, Pacific Electrical Works; S. B. Gregory, Brooks-Follis Electric Co.; Alex. Henderson, American Circular Loom Co.; W. L. Goodwin, Sterling Electric Co.; A. H. Elliott, Oakland's boy councilman; H. F. Froesch, Federal Electric Sign Co.; J. R. Cole, J. R. Cole Co.; E. M. Scribner, Western Electric Co.; A. E. Drendell, Drendell Electric Mfg. Co.; R. J. Davis, Standard Electrical Works; H. C. Thaxter, Standard Electrical Works; C. A. Gilsen, Crescent Electric Co.; R. D. Holabird, Holabird Reynolds Electric Co.; A. W. Ballard, General Electric Co., Los Angeles; R. W. Van Valkenberg, California Electrical Works; B. C. Holst California Electrical Works; E. N. Fobes, Fobes Lamp Co.; Wm. A. Ekberg, Manufacturers' Agent; E. B. Strong, "Journal of Electricity."

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VOL. XX JANUARY 18, 1908 No. 3

EDITORIAL.

WIRELESS TRANSMISSION.

Throughout Dickens' most beautiful characterization of child life, Paul Dombey's constantly recurring conundrum is, "What are the wild waves saying?" This beautiful thought, like many others, has become commonplace, and is now too often applied facetiously. But every enigma will ultimately be solved even as was that of the Sphinx and today we are understanding what one wave variety, the Hertzian, is saying, having partly tamed its wild nature to our needs. For these electro-magnetic waves, most of whose properties were mathematically forecasted by Clerk Maxwell over forty years ago, long before they were experimentally discovered by Hertz, are the medium of wireless transmission, whether telegraph, photograph, telephone or power. Even he was unable to apply them practically, and it was not until Marconi perfected his wireless telegraph that this promising infant was born. Its baby growth has been rapid, being nurtured under the direction of the Telefunden, De Forest, Fessenden, Shoemaker, Lodge-Muirhead, and other systems now so numerous and successful that Marconi stations constitute only about one-fifth of the fifteen thousand stations throughout the world. An account of the fundamental principles of the telegraph will make clear those governing the others.

All the systems are alike in consisting of an alternating current source, sending a high frequency wave motion through the ether to a sensitive receiving station. The Marconi plant at Glace Bay, Nova Scotia, which communicates with Clifden, Ireland, has as a current supply a 350-kilowatt, 3-phase alternator generating at 2,000 volts. The current is transformed to a high voltage by means of an oscillator or induction coil and transformer. This rapidly surging current passing through an aerial wire or antenna sends out Hertzian waves in all directions at a velocity of 186,400 miles per second. The first installations employed a vertical wire from which the waves were propagated equally in all directions, but it was subsequently found that with an inclined wire the strongest transmission is in the direction of the lower end of the wire. At the Glace Bay system there are fifty aerial wires run from the top of towers 265 feet high nearly horizontal for several hundred feet to the operating stations. Smaller stations employ the intermittent spark discharge of a condenser, batteries and spark coil, or a vibrating electric arc. This latter adaptation of the Duddell "singing arc" is being employed by Poulsen to obtain undamped oscillations, the first named methods giving short trains of waves following one another at comparatively long intervals, each commencing strongly and dying out quickly in amplitude.

It is in the receiving apparatus that we find the greatest variation in design to fulfill the function of detecting and indicating the waves. This was first accomplished by coherers, whose resistance was changed by the action of the current received. This was employed by the Telefunken Company, and the Lodge-Muirhead systems, having been discarded by Marconi for the magnetic detector, in which the conditions of a magnetized iron wire are altered. Fessenden employs a barreter or electrolytic detector, whose polarization is altered by the waves. Others have used variations in thermo-electricity, electro magnetism and current rectifiers as detectors. As a rule, the "clicks" are indicated by a telephone, which cannot be used without intermediate apparatus because of its great inductance. One of the most successful of recently invented detectors is the De Forest "audion," which consists of an incandescent filament in a vacuum, shunted by a circuit containing a battery and telephone receiver. The Hertzian waves cause variations in the current through this circuit which are made manifest by the telephone receiver as clicks of longer or shorter duration.

Having perfected instruments that would "work," there remained three problems to be solved, how far, how fast, and how secret. As to distance communication is regularly maintained across the Atlantic, and we on the Pacific have read Sitka at San Diego. The speed is being increased rapidly, but is yet much less than that now attained with wires. No practical method of absolute secrecy beyond the use of codes has yet been devised. Interference between neighboring stations is avoided by close turning to receive only specified wave lengths. A wave length of 400 meters is often used for short distances, while one of the trans-ocean stations employs waves 4,300 meters long. The International Convention recommended that wave lengths from 600 to 1,600 meters be reserved for naval purposes. With recently devised apparatus it is possible to tell not only the direction from which a message has come, but also the distance.

The progress already made in wireless telegraphy but presages that to be made in telephony. The United States Navy has installed twenty-eight sets of wireless telephones on the vessels now making the trip from the Atlantic to the Pacific, and the latest reports state that all orders between the vessels of the fleet are being satisfactorily transmitted by this means. From the preceding description of the action of the wireless telegraph we can readily comprehend that of the radio-telephone. Through the medium of a microphone transmitter sound waves correspondingly vary the amplitude of the Hertzian oscillations produced by an alcohol flame shunted across the terminals of a direct current generator, in series with which are an inductance and capacity. In the De Forest system these are received by the "audion," while the systems of Preece, Ruhmer, Arco, Poulsen and others employ different devices. All wireless telegraph stations employing a telephone in the detector can receive but not transmit the telephonic messages. The service is guaranteed for five miles, but is credited with a range of thirty. While the wireless telegraph requires an experienced operator both for transmitting and transcribing messages, the telephone may be used by anyone. Recent experiments indicate that the sound alters both the strength and the period of the oscillation, the reproduced telephonic signals being caused by the variations in the received energy. This is the most serious disadvantage of the system, for the actual energy received is necessarily small in amount. This, together with present lack of permanent record and limitation to an experimental distance of less than three hundred miles, does not give promises of great success for Poulsen's trans-Atlantic attempt in February.

The nearest approach to Tesla's ten-year-old dream of wireless power transmission is yet limited to wireless control of mechanism at a distance. By its means lamps may be lighted, motors started, or bells rung. Press dispatches state that photographs have also been transmitted in this way, but in every case there must be ample power at the receiving end. It may be directed, but it has not been transmitted. But even as the modern scientist is making real the old alchemists' dream of the transmutation of metals, so may he embody this chimera of wireless power transmission.

Discounting the future of these possibilities, certain irresponsible brokers are selling stock in heavily over-capitalized holding companies to unsophisticated innocents. Quoting from such a prospectus: "Owing to the rapidly growing recognition of the superior value of the shares of this company, the price is subject to sudden increase, and subscriptions are invited only on the distant understanding that the price is subject to momentary advance upon telegraphic advices." Anticipated earnings of 150 per cent per annum are luridly presented partly on the supposition that an uncompleted trans-Pacific service will earn nearly one million dollars annually. By unauthorized association with names of those of known probity, the lure is attractively baited. In their estimation it will be but a short time before all telegraph and cable companies will be scrapped, and the price of copper wire fall even below its present level. The sooner this really worthy system is taken from the clutches of these vampires of low promotion and high finance, the faster will it progress along legitimate channels. Wireless transmission has too much vitality to long languish in such debasing surroundings.

PERSONAL.

Stephen A. Hoag is assistant superintendent of the Seattle-Tacoma Power Co., at Seattle, Wash.

The annual meeting of the Illuminating Engineering Society was held on Friday, January 10, 1908, in the rooms of the Electrical Club, 14 Park Place, New York City, at 8:15 p. m.

Leopold Stocker, master signal electrician, U. S. Army, is in San Francisco in connection with the fire-control installation now being established by the Signal Corps in the artillery district of San Francisco.

David F. Atkins has charge of the inspection of heating, hoisting, ventilating apparatus, electrical, and plumbing work installed in the Federal buildings in San Francisco, as well as the preparation of specifications for necessary repairs.

BOOKS RECEIVED.

Volume 30, No. 1, "Proceedings of the American Society of Mechanical Engineers," is of particular value to those interested in train lighting, as it contains a paper on this subject by Mr. R. M. Dixon. Mr. Henry Hess contributes a paper on "A Journal Friction Measuring Machine." In addition to contributed discussion on papers previously published this volume contains the Year Book for 1907.

"Electrocraft Illustrated List of Approved Electrical Fittings and Revised National Electric Code" contains a list of fittings that have been examined and approved by the Underwriters National Electric Association. This is a second edition of this useful list, which is to appear quarterly hereafter. It is from the Electrocraft Publishing Company, of Detroit, Mich., and sells for fifty cents.

The National Electric Light Association sends the proceedings of its Thirtieth Convention, held at Washington, D. C., June 4, 5, 6, 7, 1907. These two volumes contain a great amount of interesting and valuable information on the commercial development and management of central stations, as well as technical papers on recent progress in the development of power apparatus and applications. This information is both practical and technical, and illustrates the advantages of membership in the Association.

"Proceedings of the American Institute of Electrical Engineers" for January, 1908, besides the usual notes and comments, contain the following papers: "An Exhaust Steam Turbine Plant," by Henry H. Wait; "A New CO_2 Recorder," by C. O. Mailloux; "Discussion at Niagara Falls Convention, June 27-28, 1907"; "Practical Aspects of Steam Railroad Electrification," by W. N. Smith; "A Single-Phase Railway Motor," by E. F. Alexanderson; "The New Haven System of Single-Phase Distribution with Special Reference to Sectionalization," by W. S. Murray; "The Best Engineering Education," by Charles F. Scott; "Electrical Engineering Education," by Charles P. Steinmetz.

TRADE NOTES.

The Foos Gas Engine Company operate the largest plant devoted exclusively to gas engine manufacture, and their business is being extended very rapidly.

The Foos Gas Engine Company, of Springfield, Ohio, have purchased the business of the Marinette Gas Engine Company, which comprises the line of Walrath multiple-cylinder engines for electric and power work, from 20 to 500 horsepower.

D. P. Dyer, United States District Judge, has reduced the award of Henry H. Denison, special master in the patent infringement suit of the Westinghouse Electric and Manufacturing Company against the Wagner Electric Manufacturing Company, from $132,433.35 to $1 and costs. The suit was filed in 1902, and charged an infringement of patent. The Wagner Company admitted there had been a slight infringement of the patent, but asserted that it was only a small part of the entire apparatus.

TRADE CATALOGUES.

A beautifully illustrated and printed book from the Allis-Chalmers Company describes the Keewatin Flour Mills and other notable plants equipped by this company.

Murray Iron Works Co., of Burlington, Iowa, sends a unique illustrated catalogue giving the Nomenclature of Murray Corliss Engines, showing all the parts in detail and assembly, and giving their names.

The Westinghouse Machine Company of Pittsburg, Pa., send an interesting illustrated description of the Westinghouse Storage Battery Auto-Truck for Industrial Railways, which satisfactorily solve the problem of the economical moving of material about large works.

The Thirty-eighth Annual Catalogue of the Worcester Polytechnic Institute, of Worcester, Mass., indicates the thoroughness of the courses given. The register of graduates shows that 1,201 men have completed courses.

"Public Service," from the Portland Railway, Light and Power Co., is, as usual, filled with helpful hints for the power user. The cover illustration shows the interior of the new generating station at Cazedero, Oregon. Local applications of electric drive for machine and printing offices are illustrated, and a number of attractive lighting and heating installations portrayed.

The California Electrical Works of San Francisco, Pacific Coast agents for the Western Electric Company, announce that their new telephone catalog, covering Standard Bell Telephone Apparatus and Telephone Supplies of all descriptions, will be ready for distribution the first week in January. They are also receiving proof for a large and handsome General Supply catalog. Persons wishing copies of either or both the above should write for them immediately.

MEETING NOTICE.

The San Francisco Section of the American Institute of Electrical Engineers has been reorganized, with a new directive board formed, consisting of A. M. Hunt, chairman, F. G. Baum, W. W. Briggs, Paul Downing, and Geo. R. Murphy, secretary. The first meeting will be held Friday, January 24, in the basement of the California Gas & Electric Corporation Building, corner Franklin and Ellis Streets, San Francisco, at 8 p. m. An informal dinner for old members will be held at 6:30 o'clock, at the Old Poodle Dog Restaurant.

The next meeting of the New England section of the Illuminating Engineering Society is the annual meeting at which officers for the ensuing year will be elected in accordance with notice already sent out. The meeting will be held at 8:00 p. m., Tuesday, January 14, 1908, in the Edison Building, 39 Boylston Street, Boston, in the Assembly Hall, on the seventh floor, instead of as usual on the third floor. A paper entitled, "Effects of Light upon the Eye," by Dr. H. H. Seabrook, of New York, will be read by the author.

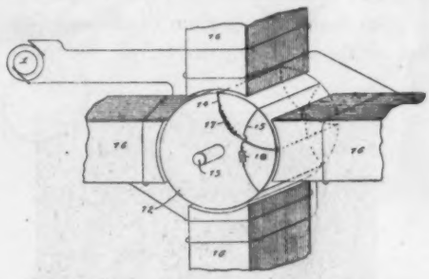
PERSONAL.

H. F. Froesch has located in San Francisco, as the representative of the Federal Electric Sign Co., of Chicago. He was in the light and power department of the Chicago Edison Company for fifteen years.

PATENTS

ELECTRIC MOTOR. 875,178. Dugald C. Jackson, Madison, Wis.

In an induction motive device, the combination with means for creating a single phase alternating field, of an armature subjected to the action of single phase alternat-



ing field provided with a plurality of electric circuits, and phase modifying means to enable the armature to start from a state of rest associated with circuits for the purpose of creating out of phase currents in armature.

TELEPHONE-TRANSMITTER. 875,138. Christian Umbach, New York, N. Y., assignor to Western Electric Company, Chicago, Ill.

In a telephone transmitter, a button provided with a movable electrode having an angular stud projecting therefrom, a diaphragm, means for supporting button, and

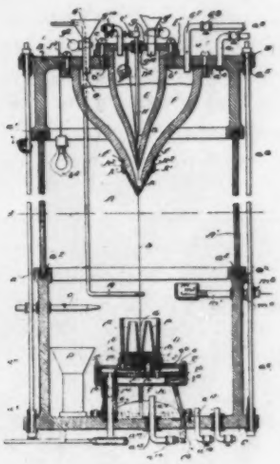
diaphragm in angular relation to each other, diaphragm having an opening through which stud projects, and means for securing diaphragm to stud, means being self-adjusting to adapt itself to the angle at which the stud and diaphragm are assembled.

INCANDESCENT ELECTRIC LAMP. 874,977. Chas. L. R. E. Menges, The Hague, Netherlands.

The process of producing incandescent conductors or filaments for electric lamps, consisting in intimately mixing a material having electric conductivity with a non-conducting substance, by producing in the shape of the incandescent conductor, a mixture of the non-conducting substance, carbon, and an oxygen compound of a metal and heating said mixture by an electric current until the carbon by its combination with the oxygen of the named compound parts in the gaseous state, leaving the metallic material in the filament.

MACHINE AND APPARATUS FOR MANUFACTURING FILAMENTS FOR ELECTRIC INCANDESCENT LAMPS. 874,938. Francis M. F. Cazin, Hoboken, N. J.

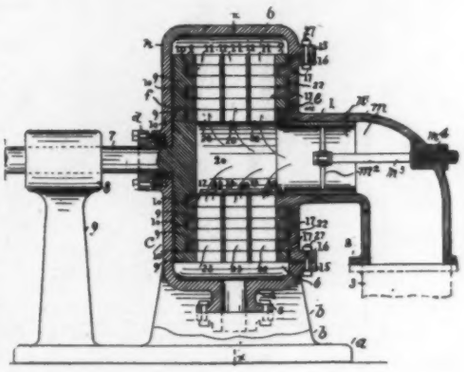
In an apparatus of the character stated, an exhaustible vessel, a plurality of receptacles having concentrically arranged squirting mouths, receptacles adapted to receive



semi-plastic material, means for maintaining such material in the semi-plastic liquid condition and for forcing such material out of the squirting mouths in the receptacles, receptacles having their squirting mouths arranged to discharge into exhaustible vessel and means for simultaneously forming such squirted fillet into the final shape desired.

TURBINE. 875,131. Byron Stevens, Oakland, Cal. Filed September 7, 1907.

In a turbine motor, the combination of a tubular casing, a shaft entering the same on one side, a rotatable disk in the casing on the end of the shaft close to one wall thereof having a series of concentric tubes provided with openings or blades on the inner face of disk, a second series of concentric tubes with openings or blades connected to



the opposite wall of the casing, the inner tube of which incloses a chamber extending to the face of disk on one end and communicating at the opposite end with an intake or supply pipe, a slide valve in pipe, with a peripheral space of the casing surrounding tubes provided with an exhaust pipe.

INDUSTRIAL

TUNGSTEN SERIES INCANDESCENT LAMPS.

The city of Grosse Point, Michigan, has recently installed a series tungsten incandescent street lighting system where the advantages of this kind of lighting are well exemplified. The station equipment consists of two 8.8-kilowatt, 5½-ampere constant-current transformers. One of these is held in reserve, while the other supplies current to seventy-seven 60-candlepower General Electric tungsten series incandescent lamps, suspended from artistic iron poles. All wiring is laid in conduits to the poles and wires pass up the center of the pole to the lamps. The form of poles used not only gives a very substantial line construction, but makes a much more artistic appearance than the usual wooden pole. These poles and lamps are shown in Figs. I and II.

FIG. 1.

FIG. 2.

One of the interesting features of this system is the radial reflector with which the lamps are equipped. This form of reflector, which was recently developed by the General Electric Company, is so constructed that the light is spread and projected very evenly over considerable area, instead of being nearly all concentrated in a circle around the lamp. Fig. III shows the candlepower distribution of a 40-candlepower series tungsten lamp, equipped with a radial reflector. Fig. IV shows one of these reflectors on a lamp. It may be seen from the diagram of the candlepower distribution that at about 30 degrees below horizontal the effective illumination is 50 candlepower, making the efficiency at this point about 1 watt per candlepower.

The series sockets with which these lamps are provided are so constructed that when a lamp is removed from the socket, two contact plates of large area close together before the lamp is quite drawn out of the socket, leaving no danger of an open circuit at any time.

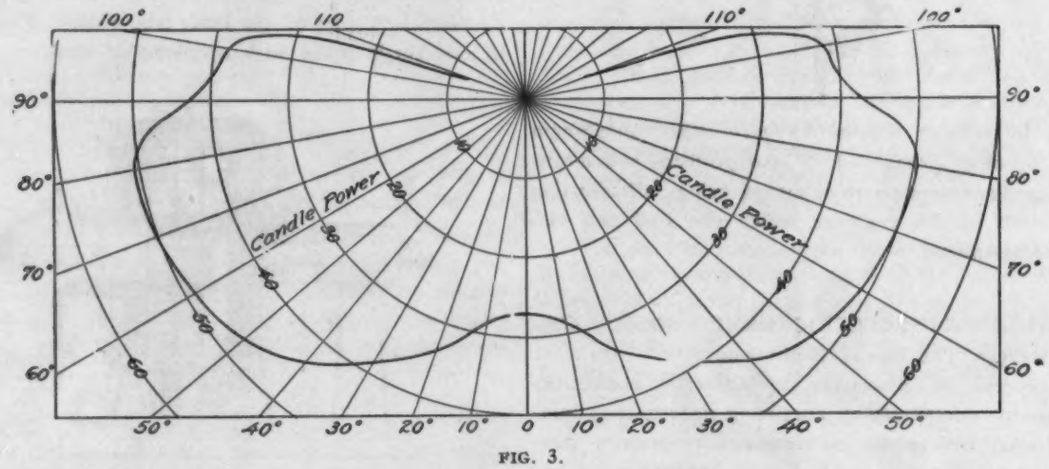


FIG. 3.

Tungsten series lamps are made in 32, 40 and 60-candlepower sizes, with current ratings of 4, 5.5, 6.6 and 7.5 amperes, and are exceedingly hardy on account of the heavy short filament. They will burn for nearly 1,000 hours at efficiency of from 1¼ to 1½ watts per candlepower.

Another installation of series tungsten lamps for street lighting has recently been made in Grand Rapids, Michigan. The lamps are of 60 candlepower, and were placed on one of the principal streets of the city. Judging from the complimentary remarks of the press and the City Council, the test installation has proved highly satisfactory.

FIG. 4.

The tungsten lamp, with its high efficiency, should greatly increase the use of series incandescent lights in suburban and residential districts where the thick foliage makes it necessary to have the units distributed at short intervals to produce satisfactory illumination.

Allis-Chalmers Company's bulletin No. 2027, entitled "The Hydro-Electric Plant at Trinity River, California," contains information of an interesting power transmission system. This plant is in the central part of Trinity County, Cal., two miles below the town of Junction City, where Canyon Creek, from which the water used for power is obtained, flows into the Trinity River, having a drainage area of fifty-two square miles. The dam, which is small, serves merely for diverting the water. Alternating sections of ditch and open flumes, with a total length of 5,250 feet and a tunnel 1,821 feet long, are comprised in the system. An effective head of 600 feet, or working pressure of 260 pounds per square inch, is obtained from two penstocks, each 1,165 feet long. This power house is equipped with Allis-Chalmers electrical machinery, consisting of two three-phase, 25 cycle generators, each 750 kilowatts, 500 revolutions per minute, 2,200 volts, seven step-up transformers and auxiliary apparatus.

DIRECT CURRENT SPARKING.

Direct current dynamos spark less with carbon than with copper brushes when working with variable load and consequent shifting of ideal brush position. Carbon has a higher contact resistance, checking sparking currents, and preventing short circuiting, and less friction, allowing smaller commutator wear.

Electrical engineers in the employ of E. H. Harrison, Julius Kruttschnitt, and E. E. Calvin have finished a preliminary report on the proposed electrizing of the Sierra Nevada Mountain division of the Southern Pacific main line to Ogden and Omaha.

INDUSTRIAL.

The new Benjamin separable wireless cluster, as shown in the accompanying illustration, consists of two principal parts, separably connected, making it possible to attach or remove body portion without disturbing the wiring connections. With this cluster the supporting base, together with insulating base carrying binding screws, may be installed while construction work is under way, and the body portion can be instantly attached at any time when the building is completed, by means of the bayonet snap lock. As the binding screws are accessible from the front, slack wire is unnecessary.

Receptacles mounted on the body portion, form short sockets with which any standard shade-holder may be used. The supporting base is small enough in diameter to pass through any ordinary reflector with 3¼-inch fitter, and glassware may be installed or removed without disturbing wiring connections.

Only two forms of insulating base are necessary to cover the entire range of lights: the first will take any number in the circle, from two to six (type 5); the second, any number with additional center light from three to seven (type 5K). To proceed with an installation requiring clusters for different numbers of lights, it is necessary only to have in stock the correct number of either type, i. e., since only two forms of bases are required, regardless of the number of lights in question, the proper bases may be installed from

among the clusters at hand, and the body portions having the requisite number of lamp openings transferred from other clusters procured later on. Clusters with center-lamp openings are furnished with three binding posts, whereby center lamp may be operated independent of the side lights. This three-wire connection may be changed to a two-wire, by merely extending one of the wires to the additional binding screw.

The Benjamin Separable Wireless Cluster is light in weight, compact in structure, and neat in appearance. There are no porcelain parts visible, and the finish can be made to conform to any requirements. It is especially adapted as a center piece for spread-electric or combination fixtures.

NEWS NOTES

OIL.

San Francisco.—Figures published by the oil exchange show that with the year just closed $12,511,646.58 has been paid in dividends by the listed oil companies of the State.

Vallejo.—It is reported that the Standard Oil Company is preparing to locate an auxiliary oil supply station on the water front of this city, which will be used in supplying oil for use on the Mare Island yard.

San Francisco.—The Independent Oil Company has been granted a permit to lay an iron pipe in Potrero Avenue, Fifteenth and Utah Streets, to be used for the conveyance of crude oil from tank cars to storage tanks.

Bakersfield.—The Producers' Sales Agency has authorized President St. Clair and other officers to make all necessary arrangements to construct an oil pipe line to the railroads, build loading tracks, provide for the storage at San Francisco Bay, secure contracts, and do all other things necessary.

San Francisco.—Contracts have been signed by the Standard Oil Company for the purchase of high grade oil in the Santa Maria fields at eighty-five cents a barrel. This is a record price and will prove an impetus to development in all the petroleum regions of the State. The last contracts made in the Santa Maria fields were on a fifty cent basis.

Bridgeport.—Advices from Mono Lake state that the oil boom is now on. Preparations for boring are being made, but so far no actual work has been done. It appears that the island is the bone of contention at the present time and a lawsuit may result. One set of locators has possession of the island and refuses to allow others to go on the ground to work. The island is located three and four claims deep.

Santa Maria.—Reports from the Santa Maria Oil Fields state that the production of the field at present ranges from 800,000 to 900,000 barrels a month, of which fully ninety per cent is piped to Port Harford. The Union Oil Company of California is turning out sixty per cent of the total amount and is the most successful operator in the field. The Standard has practically no control over this field on account of the water transportation, and is receiving only about 155,000 barrels a month.

Los Angeles.—Advices from Bakersfield state that the Standard Oil Company has raised the purchasing price of all oil to forty cents a barrel, regardless of contract price, whether thirty or nineteen cents a barrel. The Associated is reported to have met this price. The first rumor concerned only the Midway 3,500,000 barrel contract. The Midway contract was made by the Mascot Oil Company, other Midway producers participating, and a thirty cent price was fixed, the Standard carrying a pipe line into the field and receiving oil. The increase to forty cents is considered a victory for the independents in their fight for higher prices. All companies of the agency are pumping oil, but are running it into tanks. A minimum of seventy-five cents is their aim, and they are determined to market their own product.

ILLUMINATION.

Redwood City.—The Board of Supervisors has granted W. J. Martin a franchise to maintain an electric light plant in First Township for lighting and heating purposes.

Glendora.—Mr. Gauslein, of the Southern California Gas Company, states that all arrangements are completed for the erection of a gas plant and the installation of a gas system at Glendora.

Corona.—The Corona Gas & Electric Light Company will build a line seven miles in length to the Pedley power-house, which will be capable of transmitting 17,000 volts of the electric current to its plant in this city.

Imperial.—At a special session of the City Trustees a resolution was passed for the placing of electric lights on the streets. It is understood that the contract for lighting the city will go to the Holton Power Company.

Ocean Park.—The Seaboard Construction Company has presented to the Ocean Park Board of Trustees a plan for providing a city gas and electric lighting plant. The plan will receive the attention of the board at its next regular meeting.

Hermosa.—At a recent meeting of the City Council a communication was read from the Watson Construction Company stating that for $24,000 they would install a gas plant in Hermosa, including seven miles of mains, with a capacity of 120,000 cubic feet per day.

Tucson, Ariz.—E. B. Reeser, secretary and treasurer of the Mineral Hill Consolidated Mining Company, has returned from Pittsburg, and states that his company has arranged for the necessary capital to erect an electric light plant. The order will be placed in Denver and the plant will be delivered as soon as possible.

Silver City, N. M.—The New Mexico Light, Heat & Power Company is installing several new pieces of machinery, including a 1000-kilowatt alternating generator, having a capacity of 2,200 volts. The present building will be enlarged so as to have all the machinery under one roof. The improvement to the plant will necessitate the complete reconstruction of poles and wires.

Eureka.—All of the stock of the Eureka Lighting Company has been transferred to the Humboldt Gas & Electric Company, which will eventually absorb both lighting companies of this city. There are now three lighting companies in Eureka—The Eureka Lighting Company, the Humboldt Gas & Electric Company and the North Mountain Power Company. All of the companies are now controlled by the people interested in the North Mountain Power Company.

Oakland.—The lower part of Broadway, between First and Seventh Streets, is to be lighted with thirty-six electroliers within the next six months. A resolution was introduced at the City Council by which it was agreed the city would pay the expense of lighting the electroliers, which are to be put in place by the merchants. Merchants on the lower part of Broadway will ask for better lighting facilities. An effort will be made to obtain a heavier voltage than is allowed for the lamps in the upper part of the city. The electroliers on Twelfth Street are said to be defectively wired. Several efforts to repair the defects have been made, but without success.

TRANSPORTATION.

San Francisco.—John E. West has been acquitted of the felony charge of having interfered with the trolley wires of the United Railroads on September 20th last.

Los Angeles.—The Los Angeles-Pacific Railway Company has started work on a line to Toluca from Santa Monica Avenue. It is said an effort is being made to beat the Huntington lines into the San Fernando field.

Azusa, Cal.—The City Trustees have adopted the ordinances granting to the Los Angeles Interurban Railway Company the privilege of constructing a spur track over public streets and over private property in Azusa.

Phoenix, Ariz.—Harry J. Bennett, one of the promoters of the proposed electric line between Phoenix and Mesa, states that the project would include the building of a bridge across Salt River. Gasoline motors may be used instead of electricity.

San Francisco.—The application of G. B. Willcutt for the United Railroads for a cross-town street-car-line franchise via Scott, Duboce and other streets was rejected by the public utilities committee of the Supervisors on the ground that the Board should not issue franchises to third parties.

San Francisco.—The retiring Board of Supervisors decided that it would be inadvisable to experiment with a municipal street railroad at the present time, and the $720,000 provided for the acquisition of the Geary Street line will accordingly be devoted to the improvement of streets and sewers and the rehabilitation of public buildings.

Berkeley.—The San Francisco, Oakland & San Jose Railroad Company, known as the Key Route Company, has filed an application with the Trustees for a franchise along Sacramento Street from the south to the north town line, tapping the northwestern district of Berkeley and running to the proposed State Capitol site. The application asks a right of way for fifty years. The company asks for a permit to construct a single or double track electric road and will begin work six months after the ordinance is granted and operate trains within two years.

Pasadena.—The residents of North Pasadena, who have been working for an electric line, have determined to build the road without bonds and without the co-operation of the railroad companies. The line is to run along Lincoln and Piedmont from the Pacific Electric line to the mouth of Millard Canyon. The money needed, $84,000, will be raised by property owners along the line. They will not only build the line and buy cars, but will build a power plant on the government reserve in the mountains. A. J. Toolen, of North Pasadena, is at the head of the movement.

TRANSMISSION.

Los Angeles.—Machinery is being installed on Cottonwood Creek for the power plant to be used in dredging the Owens River, which will be ready by May 1st. The plant will have 1200 horse-power.

Oroville.—The Great Western Power Company, which is constructing a large power plant in the Feather River Canyon, a few miles above Oroville, promises that power will be furnished by the company in October. The total cost of the plant will be $6,000,000. Its total capacity when completed will be 100,000 horse-power. The Feather River is being diverted through a tunnel built at Horseshoe Bend. Indications point to the fact that the company will furnish the power for electrifying the Western Pacific over the mountains.

Salt Lake City.—The Utah Light & Railway Company will begin the work of erecting a $300,000 power plant at Devil's Gate, eighteen miles east of Ogden, early in the spring. The plant will have a capacity of 2000 horse-power. The plant is necessary on account of the increased demand of the company for electric power. The site was purchased jointly by the Utah Light & Railway Company and the Utah Construction Company about four years ago. Some work has already been done on the plant, but active work will not begin until spring.

Goldfield.—General Manager Poole, of the Nevada-California Power Company, which has its generating plant at Bishop, Cal., says that the electricians will be paid $6 per day after January 10th, but that the Brotherhood of Electricians will not be recognized. The employers state that hereafter the open shop will prevail in this district, but that there will be no discrimination against union men. The scale of $6 a day is $1 higher than that formerly proposed. The members of the union say they are willing to accept the reduction, but object to the open shop. A walkout of electricians is imminent.

FINANCIAL.

Porterville.—The waterworks bonds amounting to $50,000 were carried at the election last week.

Roswell, N. M.—The City Council has passed corrective ordinances placing the bond elections for water works, sewer, ditch and fire department improvements to the amount of $165,000, on February 20th.

San Francisco.—According to the report of A. H. Payson, president of the Spring Valley Water Company, submitted to the stockholders at their annual meeting, the corporation faces a deficit of $73,156.23 as a result of the year's operations. This is ascribed to the large expenditure of $347,850.84 for replacement and equipment of sections of the plant destroyed by the big fire. Had the company secured the $160,000 which it endeavored to obtain from the city, the deficit would have been turned into a surplus. The president's report paints a dark picture for the future, with suggestions of a water famine. The report gives approximate figures as to the company's outgo and income during the last year. Water sales brought in $1,870,560.03; other revenues were $54,189.34. There were $97,754.07 delinquencies on the 1906 collections, making the total revenues $1,772,806.24. The 1907 delinquencies, $72,247.71, have been carried forward. The expenses were: Normal, $604,278.58; abnormal, due to replacement and equipment since the fire, $347,850.84; taxes paid and accrued, $301,830.10; coupon interest, $718,440; total, $1,972,399.52; deficit, $73,156.23. A gratifying increase in business is reported. December 31, 1905, there were 53,113 rate payers; after April 18, 1906, 29,931; December 31, 1906, 37,538; December 31, 1907, 47,293. The number of small consumers is larger than before. On December 30, 1905, there were 4,743 bills of $1 or under, while on the same date in 1907 there were 8,367. The following directors were elected: A. H. Payson, president; J. M. Quay, Homer S King, I. W. Hellman, Jr., W. B. Bourn, J. Henry Meyer and F. B. Anderson. Of the 280,000 shares of the company, 179,755 were represented at the meeting.

TELEPHONE AND TELEGRAPH.

Honolulu.—It is reported here that the Matson Navigation Company will install a wireless station on this island for its ships, and that some of the Planters' line of ten sailing vessels, reported sold to the Matson people, will be equipped with wireless.

Helena.—It is probable that the strike of employes of the Rocky Mountain Bell Telephone Company in the States of Utah, Wyoming and Montana will be amicably settled. At a conference between the affected interests all matters were agreed upon, save the demand of the unions that the injunction secured in the Federal Court here restraining interference with the business and property of the company be dismissed.

Yreka.—Hessig Bros. have just completed the extension of their telephone line from Oak Bar to Hamburg Bar. Their intention was to complete it this winter, but owing to the bad weather it was thought advisable to delay the work. The old line from Yreka to Happy Camp has been purchased by them, and they will use it until they complete the new line. It is also their intention to run a line into Scott Bar, so that when the work is completed all of the towns in the county will have direct telephone communication.

Vallejo.—Operator Millison of the navy, who is deemed an expert in long distance wireless telegraphic communication, has just established a coast record. In charge of the new station recently established at Sitka, Alaska, he has succeeded in establishing connection with Mare Island station and the station at Point Loma, the extreme southern point of the California coast. During the last week he succeeded in exchanging messages with all the vessels of the navy along the coast equipped with wireless apparatus.

TRANSMISSION.

Red Bluff, Cal.—A notice of the appropriation of 10,000 inches of water in Thomas Creek has been filed by J. H. Howell, of Henleyville.

Oakland.—The engineers of the Great Western Power Company, which acquired property on Brooklyn Basin, south of Fifth Avenue, in East Oakland, are now at work with the intention of constructing a large power plant there.

Nevada City, Cal.—The Telluride Power Company has recently located water rights in Mono County and will establish plants to supply Nevada mining camps with electricity. The company already has one plant in operation near Bridgeport.

Sacramento.—F. E. Fitzpatrick has resigned his position as superintendent, at Sacramento, Cal., of the California Gas & Electric Corporation. His time is now entirely occupied with his work as general manager of the John Martin interests.

Williams, Ariz.—Civil Engineer Park Latimer is at Lee's Ferry, 150 miles up the Colorado River from Bass' camp in the canyon, to make a preliminary survey of water locations for a French syndicate. A power project to furnish power to surrounding mines will be carried through if the survey proves the scheme to be practicable.

Fresno.—The Kings River Power Company of Los Angeles has given notice of the appropriation of 25,000 inches of water from the Kings River to propel machinery for the generation of electric power at the power-house to be located on section 25-12-28, and to be transmitted to Fresno, San Francisco and Los Angeles.

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